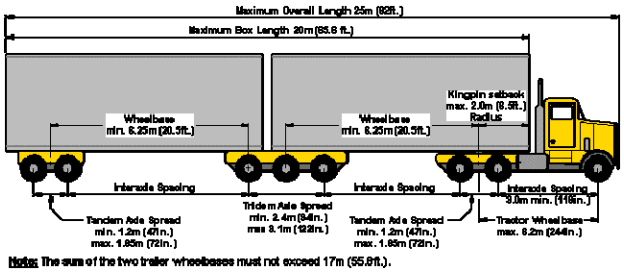
Investigation of Various Impacts of Allowing Canadian B-Trains at Full Alberta Weights to Operate on the I-15 Corridor North of Great Falls, MT



From: Alberta Government: Infrastructure and Transportation

by

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An MPART proposal prepared for the
Montana Department of Transportation
2701 Prospect Drive,
Helena, Montana

September 13, 2007

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PROBLEM STATEMENT

The Montana Department of Transportation (MDT) is investigating the impacts of allowing Canadian B-trains operating at the weight limits used in Alberta, Canada to travel on Interstate Highway 15 between Great Falls and the Canadian Border. In an 8 axle configuration, the maximum allowable gross weight of a B-train in Alberta of 140,000 pounds (Alberta Government, 2007) is significantly higher than the allowable gross weight on a comparable 8 axle Montana A-train of 117,000 pounds. Therefore, it is expected that users and providers of transportation services may make adjustments in their operations to take advantage of this increased cargo capacity. Subsequent impacts associated with these adjustments range from changes in the composition of the traffic stream along this corridor, to changes in the demands the new vehicle stream places on the highway infrastructure of the corridor, to changes in the economic activity of the industries associated with the specific freight hauled by these vehicles. Investigation of these various impacts is essential in assessing the feasibility of moving forward with this initiative. Furthermore, based on the assessment of the impacts of extending the operation of Canadian B-trains on this specific segment of I-15 to Great Falls, it may be possible to obtain an indication of the economic impacts that would be realized if their operations were further extended along this corridor.

BACKGROUND SUMMARY

Based on extensive research, the Roads and Transportation Association of Canada (RTAC) developed guidelines on vehicle size that might serve as the basis for standardization of vehicle regulations across Canada. These guidelines, often referred to as the Canadian Interprovincial Limits on truck size and weight, were developed with the intent of optimizing vehicle performance relative to productivity, safety, and level of infrastructure demand. These guidelines were subsequently adopted by Alberta in 1988 (Alberta Transportation and Utilities, 1992) and, with some modifications over the years, are the basis of current size and weight regulations in Alberta and other Canadian provinces (Task Force on Vehicle Weights and Dimensions Policy, 2005).

Within the suite of Canadian Interprovincial vehicle configurations, the B-train has the greatest allowable gross weight. For many commodities (e.g., bulk dry and liquid products), the B-train has become a common method of transport in Canada. While these vehicles can operate in Montana, they must do so at lower maximum gross operating weights than in Alberta, if they are to meet Montana's regulations on vehicle size and weight. Typical B-trains capable of operating at 140,000 pounds in Alberta can only operate at a maximum gross weight in Montana of 113,000 pounds to meet the state's weight regulations. The lower weights allowed in Montana are in place to ensure the level of demand placed on the state's highway infrastructure is consistent with that assumed in its design and capacity assessment. Since such assessments generally are conservatively made, it is possible (under controlled circumstances and typically with limited traffic volumes) to operate vehicles at weights in excess of current limits while maintaining user safety and protecting the highway infrastructure from unacceptable acceleration in load related deterioration.

Network level studies have been done on the impacts of allowing heavier vehicles (including vehicles operating under Canadian Interprovincial limits) to operate on highways in the United States (Transportation Research Board, 1990a and 1990b; Stephens, et al, 1996 and 1998, Transportation Research Board, 2002). These studies generally have concluded that allowing heavier vehicles to operate on selected elements of the existing highway system results in a net benefit to society. For several reasons, including uncertainties in the analyses that were performed and in the subsequent outcomes predicted, these findings have not generally been acted on. This project offers another opportunity to investigate the expected impacts of introducing a new, and possibly more productive vehicle into the traffic stream in this country. Unlike past studies which were conducted primarily at the network level, this study will take a closer look at these impacts on a finite section of a transportation corridor and a specific region/community along this corridor. Thus, this analysis will offer a new perspective on a topic that has been of particular interest to the transportation community for the past couple of decades. Furthermore, this topic is expected to continue to be of particular interest to the transportation community, in light of anticipated future freight demands on the country's already strained transportation infrastructure (Cambridge Systematics/Battelle Institute, 2005).

OBJECTIVES

The specific objectives of this project are:

1) to determine the expected changes in truck traffic on the Interstate 15 corridor between Great Falls and the Canadian border if Alberta Canadian B-trains are allowed to operate on this section of highway (note that such vehicles can already operate on this corridor between Shelby, MT and the Canadian border, which is within the study area).
2) if an increase in truck traffic is expected, to further determine the economic impact of this increase in the Great Falls area.
3) depending on the outcome of the analysis for Great Falls (i.e., if an economic benefit is expected), to determine the benefit expected in other Montana communities if the corridor is opened to heavier B-trains statewide.
4) to identify the issues, if any, that motor carriers are currently facing along this corridor in filling backhauls.

This information will be provided to MDT for their use in further study of permitting B-trains operating at Alberta weight limits to travel on the I-15 corridor to Great Falls.

BENEFITS

This study will provide immediate benefit to the state of Montana through the information it provides to support the state's investigation of the relative benefits and costs of allowing Canadian B-trains to operate on the I-15 corridor north of Great Falls.

Further and significant long term benefits will be realized from this project by both Montana and the rest of the country through the additional information and new perspectives that it offers on the important issue of how changes in truck size and weight regulations can impact regional highway use and economic activity.

RESEARCH PLAN

The objectives of this project will be realized through the five tasks described below:

Task 0. Project Management - Project management will primarily involve two subtasks: working/communicating with the project sponsor and preparing project deliverables. Project deliverables consist of quarterly progress reports and a final report at the end of the project.

Task 1. Literature Review – Available published information on assessing the impacts of changes in truck size and weight regulations on vehicle operations and economic activity will be collected and reviewed. The focus of the review will be on the parameters considered, methodologies used, and outcomes realized in any similar studies that have been performed.

Obviously, close attention will be given to any information available on actual situations in which changes in truck size and weight regulations have been made. Information will also be collected on cross border trade between Montana and Canada (focusing as possible on the I-15 corridor, with particular attention on Great Falls).

Task 2. Establish Commodity Flows – The current commodities being moved between Great Falls and Alberta, and the manner in which they are being moved, will be determined using existing data available from MDT and other public agencies, significantly complemented by information obtained from direct interviews with users and providers of transportation services in Alberta and Great Falls. Changes in transportation activities associated with B-train operation are expected to range from relatively uncomplicated changes in which existing trucks are simple replaced with B-trains to take advantage of their apparent increased productivity (i.e, a constant volume of freight is moved), to more complex situations in which the increased productivity of the B-trains results in a) more new freight being moved by truck along the corridor and/or b) diversion of existing freight along the corridor from rail to truck. All of these outcomes are best analyzed by interviewing typical shippers and users of transportation services along the corridor and developing case studies to estimate impacts on an industry-by-industry basis. The results of these case studies can than be extrapolated as necessary to encompass all of the economic activity in the Great Falls area, as well as to other similar areas around the state. Users and providers of transportation services in both Alberta, Canada, and in the Great Falls area will be identified and interviewed in this process. In executing all analyses, the impacts at Shelby of extending B-train operation to Great Falls will also be specifically assessed as possible.

In the process of identifying expected changes in commodity flows if B-trains are allowed to operate to Great Falls on the I-15 corridor, the assumption will be made that the gross vehicle weight fees collected by the state for these vehicles will simply be proportionally extrapolated from the current gross vehicle weight fee schedule. The state's gross weight fee schedule is intended to generally reflect the relative cost of providing service to the various vehicles that use the highway system. Thus, it may be necessary to revisit this assumption on the weight fees that should be paid by B-trains in future analyses, depending on any reviews that are conducted on their impact on the highway infrastructure.

Task 3. Generation of New Traffic Streams – In Task 3, traffic streams will be developed to carry the commodity flows identified in Task 2. Changes in the number, configuration, and weight of the vehicles operating on the I-15 corridor north of Great Falls will be determined. While listed as a distinct task, the commodity flows are interdependent on the means available to move them; thus, it is expected that much of the information to support work on this task will be collected as part of Task 2.

Task 4. Economic Impacts – Once again, while shown as a distinct task, the analysis of the economic impacts of B-trains operating on the I-15 corridor north of Great Falls will effectively begin as information is collected on current commodity flows along this corridor and the expected future changes in these flows if these vehicles operate on this section of highway (Task 2). Based both on information in the literature and interviews with users and providers of

transportation services along this corridor, estimates will be made of basic changes in the costs of highway transportation service along the corridor and the ensuing changes that will occur in shipping patterns (i.e., changes in vehicles, modes, and volume of freight moved). The economic analysis, as possible, will go beyond these "direct" impacts to further estimate and comment on the more indirect consequences of these changes, such as their effect on flows through the regional economy. A tool for performing such extended economic analyses is a regional economic model that can be purchased from third party vendors specifically for studies of this kind. These models can be expensive and, while their use will be further investigated, it is not anticipated that they will be utilized in this study (such use is not included in the current budget). Rather, the intent at this time is to quantify the direct impacts of the proposed action as described above, and then to generally extrapolate indirect impacts based on broad trends seen in this regard in similar studies. With MDT collaboration, it may be possible that the Highway Economic Analysis Tool (HEAT) recently developed for MDT to analyze economic outcomes based on infrastructure investment can be brought to bear on this problem.

One issue generally encountered in studies of this kind is specifying the point in time at which the impacts of the proposed action are to be determined. Current operations obviously are configured around existing vehicle size and weight regulations, and some time may be necessary for companies to alter the composition of their vehicle fleets and attendant facilities to fully take advantage of the opportunity to operate B-trains on the I-15 north corridor to Great Falls. In this case, an effort will be made to study both the immediate and long term (e.g., five years in the future) impacts of this change in B-train access. Notably, Canadian B-trains already operate on, and certainly just north of the corridor. Thus, many operations may be in a position to immediately take advantage of this new opportunity.

A second issue generally encountered in studies of this kind is assessing the uncertainty of the results. One technique used to address this issue is to "bound" the solution, by offering outcomes for various possible scenarios, with the assumptions used in each scenario clearly stated. It is expected that such an approach may be appropriate for this study, notably with respect to rail diversion and similar issues.

In performing analyses of this kind, factors of importance that have not already been mentioned include:

- Highway capacity
- Highway safety
- Reduced congestion
- Environmental issues (air and noise)
- Enforcement issues (weight, speed, border)

These factors will not be considered in this project.

Finally, the economic impacts of further extending B-train operations at Alberta weights along the rest of the I-15 corridor will only be generally extrapolated based on the results obtained from the detailed study of Great Falls.

Task 5. Final Report – The results of this project will be presented in a final technical report. This report will include summaries of the information collected in the course of the study,

descriptions of the analyses performed, and the results of these analyses. These results will include:

1) description of the commercial vehicle traffic operating on the I-15 corridor north of Great Falls (estimates of vehicle configurations, numbers, average weights),
2) economic impact (quantified, as possible) to the Great Falls area of allowing B-trains operating at full Alberta weights to travel along the I-15 north corridor to Great Falls.
3) discussion of further economic impacts along the I-15 corridor if B-trains are allowed to travel on it across the state, and
4) identification of current problems, if any, encountered in finding backhauls for vehicles moving on the I-15 corridor north of Great Falls.

PRODUCTS

The product of this project will be a final technical report (described in previous section).

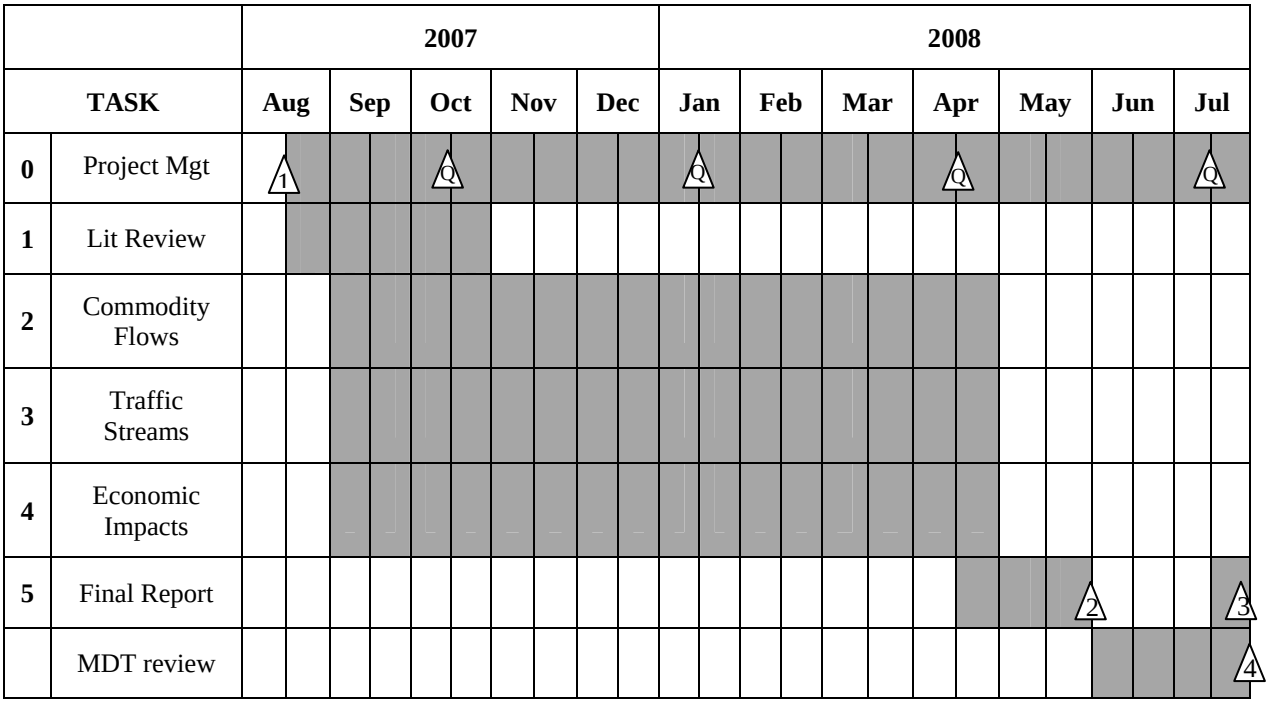
IMPLEMENTATION

The results of these analyses will be used by MDT in their further study of the impacts of permitting B-trains to operate at Alberta weight limits to travel on the I-15 corridor north of Great Falls. The study results will also provide MDT with insights on the impacts of further permitting such B-train operations on the remainder of the I-15 corridor, which will be useful in future planning activities.

TIME SCHEDULE

This project will take 11.5 months to complete. Presuming an August 15, 2007 start date, the draft final report will be delivered to MDT on May 30, 2008. Quarterly progress reports will be submitted on October 15, 2007; January 15, 2008; April 15, 2008; and July 15, 2008. Allowing a two month period for review and revision of the report, the project end date will be July 31, 2008. A detailed project schedule is shown below in Table 1.

Table 1 - Schedule



△ Milestone – 1 Start Work
2 Draft Final Report
3 Final Report
4 End Work
Q Progress Report

STAFFING

Dr. Michael Cole will be the Principal Investigator for this research project. Dr. Cole will be the primary manager and the point of contact with MDT. Dr. Jerry Stephens will be Co-Principal Investigator on the project, and he will assist/advise Dr. Cole and a student on all project tasks. The level of effort for these individuals is delineated by task in Table 2. Additional information on the principal investigators is presented in Appendix A.

FACILITIES

This investigation will be conducted using available resources at Montana State University.

Table 2 - Level of Effort by Task

Name	Role in Study	Task						Total
		0	1	2	3	4	5	
Michael Cole	Principal Investigator	16	24	48	36	48	32	204
Jerry Stephens	Co-Principal Investigator	8	10	32	32	24	20	126
Student	Data Analysis	0	20	120	120	120	80	460
Acct. Tech	Admin Support	8	0	0	0	0	0	8
Tech Writer	Final Report Prep	0	0	0	0	0	12	12
Total		32	54	200	188	192	144	810

MDT INVOLVEMENT

For this project, the Montana Department of Transportation will be asked to provide information on commercial vehicle operations on the I-15 Corridor as it is available from its existing databases and planning and other Department activities. This information will include vehicle classification and weight data for the commercial vehicles operating on the corridors being studied, and any information on commodity flows along these same corridors.

BUDGET

This project will cost $34,366 with 80 percent of the funding ($27,493) provided by MDT and 20 percent ($6,873) by Montana State University. The budget is shown in more detail in Table 3. Referring to Table 3, the indicated travel funds are for one trip to Helena for the kickoff meeting at the beginning of the project, and additional trips to Helena, Great Falls, and Alberta to obtain the information on traffic, commodity flows, and economic activity that is necessary to complete this project.

Table 3. Budget

Item	Amount
Salaries (with benefits)	$26,988
In-State Travel	$600
Out-of-State Travel	$1,000
Expendable Supplies	$50
Subcontracts	$0
Direct Costs	$28,638
Overhead (20 percent)	$5,728
Total	**$34,366**
MDT Share (80%)	$27,493
MSU Share (20%) *(MSU Share will go toward salaries, benefits and associated overhead)*	$6,873
State FY 08	$32,866
State FY 09	$1,500
Federal FY 07	$4,173
Federal FY 08	$30,192

REFERENCES

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Alberta Government (2007), "Infrastructure and Transportation: B – Train", http://www.trans.gov.ab.ca:81/docType281/production/teg043.htm

Cambridge Systematics and Battelle Memorial Institute 2005, "An Initial Assessment of Freight Bottlenecks on Highways", prepared for the Federal Highway Administration, Office of Transportation Policy Studies.

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Transportation Research Board (1990b), "New Trucks for Greater Productivity and Less Road Wear, An Evaluation of the Turner Proposal", SR 227, National Research Council, Washington, D.C.

Transportation Research Board (2002), "Regulating Weights, Lengths, and Widths of Commercial Motor Vehicles", SR 267, National Research Council, Washington, D.C.

APPENDIX A: INFORMATION ON KEY PERSONNEL

Dr. Michael Cole - Principal Investigator

Assistant Professor, Mechanical and Industrial Engineering Department, MSU
Researcher, Western Transportation Institute, MSU

Education

1995 PhD, Industrial & Systems Engineering, Georgia Institute of Technology

1990 MS, Operations Research, Georgia Institute of Technology

1988 BS, Industrial Engineering, Texas A&M University

Professional Affiliations

Professional Engineer (Arkansas)

Member, Institute for Operations Research and the Management Sciences

Member, Institute of Industrial Engineers

Key Qualifications

Dr. Cole has over 10 years experience in developing mathematical models and computer systems that aid the design of efficient and effective freight logistics networks.

Employment History

2002-present	Assistant Professor, Montana State University, Bozeman, MT (Industrial & Management Engineering Program)
1995-2002	Assistant Professor, University of Arkansas, Fayetteville, AR (Industrial Engineering, Transportation Engineering)

Key Project Experience

Empty container management for container-on-barge (COB) transportation

This project developed a mathematical model to consider the effects of pooling empty containers in making container-on-barge intermodal transportation more efficient.

(Choong, S., Cole, M.H., and Kutanoglu, E., MBTC-2003, Mack-Blackwell Transportation Center, University of Arkansas, Fayetteville, Arkansas, 2001.)

A simple approach to linehaul-backhaul problems

The project involved developing and testing a heuristic for solving the linehaul-backhaul vehicle routing problem. In this problem, vehicle routes must be designed to efficiently serve a set of customers, some which demand deliveries and some which demand pickups.

(Zhong, Y., and Cole, M.H., MBTC-1102, Mack-Blackwell Transportation Center, University of Arkansas, Fayetteville, Arkansas, 2001.)

Design of merge-in-transit logistics networks

The project involved development of a mathematical model and simple prototype decision support system for designing merge-in-transit networks, in which simple assembly/aggregation operations are preformed as part of the transportation process.

(Cole, M.H., and Parthasarthy, M., MBTC-1064, Mack-Blackwell Transportation Center, University of Arkansas, Fayetteville, Arkansas, 1998.)

Selected Publications

Choong, S., Cole, M.H., and Kutanoglu, E., Empty container management for intermodal transportation networks, *Transportation Research Part E*, Vol. 38, No. 6, pp. 423-438, 2002.

Zhong, Y., and Cole, M.H., A vehicle routing problem with backhauls and time windows: a guided local search solution, *Transportation Research Part E*, Vol. 41, 131-144, 2005.

Cole, M.H., and Parthasarthy, M., Optimal design of merge-in-transit logistics networks, MBTC-1064, Mack-Blackwell Transportation Center, University of Arkansas, Fayetteville, Arkansas, 1998.

Ho, Y., Kutanoglu, E., Bartolacci, M.R., and Cole, M.H., Modeling and analysis of transportation flows created by e-commerce transactions, MBTC-2012, Mack-Blackwell Transportation Center, University of Arkansas, Fayetteville, Arkansas, December 2001.

Landers, T.L., Cole, M.H., Walker, B. and Kirk, R.W., The virtual warehousing concept, *Transportation Research Part E*, Vol. 36, No.2, pp. 115-125, 2000.

Dr. Jerry Stephens – Co -Principal Investigator

Professor, Civil Engineering Department, MSU
Research Director, Western Transportation Institute, MSU

Dr. Stephens has been researching transportation issues in Montana for the past 15 years. His research has frequently involved bringing together traditional analyses of the engineering performance of the transportation infrastructure with broader system-wide operational and economic considerations, such as vehicle weight enforcement, freight logistics, system finance, and system productivity. He has, for example, been involved with assessing the equity Montana's motor vehicle fees, establishing a new gross vehicle weight based fee structure for commercial vehicles, and studying infrastructure and economic impacts of possible changes in the vehicle size and weight statutes in Montana. Notably, on this latter effort, both users and providers of highway transportation services in the state were interviewed relative to their current and projected operations under the size and weight scenarios to be investigated. He has worked closely on these efforts with personnel from a variety of divisions within the Montana Department of Transportation, and he is active at the national level on these same issues.

Employment History

Assistant, Associate, and Full Professor, Montana State University, Department of Civil Engineering, Bozeman, Montana; 1989-Present.

Research Director, Montana State University, Western Transportation Institute, Bozeman, Montana; 2006-Present.

Associate Professor, West Virginia University, Department of Civil Engineering, Morgantown, West Virginia; 1988-1989.

Research Engineer and Senior Research Engineer, New Mexico Engineering Research Institute, University of New Mexico, Albuquerque, New Mexico; 1976-1982, 1985-1988.

Research Instructor, Purdue University, Department of Civil Engineering, West Lafayette, Indiana; 1982-1985.

Engineering Consultant, 1979-present, design engineer and expert witness.

Key Project Experience

Economic Impact of Changes in Truck Weight Regulations in Montana (Co-Principal Investigator with Julie Hewitt, Ag-Econ/MSU). The overall impacts of changes in truck weight limits on the economy in Montana were determined in this investigation. Four scenarios were considered with different maximum allowable gross vehicle weights (GVWs). Predictions were made of the vehicle fleets that would evolve under each scenario (based on company/carrier interviews) and of the attendant changes in demands and performance of the highway infrastructure. Case studies of the impacts expected on selected industries within the state were conducted. Changes in transportation costs typically were at least an order of magnitude larger than changes in infrastructure costs. Statewide economic impacts in terms of forgone gross state product amounted to -0.4%, and in the first year alone were 2 to 20 times the infrastructure impacts, depending on scenario.

Assessing the Impact on Montana's Highways of Adopting Canadian Interprovincial Limits on Vehicle Size and Weight (Principal Investigator). Impacts on the Montana highway system of adopting Canadian Interprovincial, Canamex, and Canamex Short limits on vehicle size and weight were determined. Highway infrastructure impacts from these new and heavier vehicles were determined by developing new traffic streams, determining the engineering impact of these streams on bridges and pavements, and assigning a cost to these impacts. An increase in annual costs for bridges and pavements of 12 to 42 million dollars (11 to 36 percent) was calculated under Canadian limits (interstate and primary systems). An increase in annual costs of 4 to 9 million dollars was calculated for Canamex and Canamex Short limits.

State Truck Activities Reporting System Evaluation (STARS) (Co-Principal Investigator with Jodi Carson, Civil Engineering/MSU). The Montana Department of Transportation (MDT) engaged in a pilot project to collect better information on commercial trucking activity on the state's highways using an extensive statewide network of weigh-in-motion (WIM) sensors. This data was collected to improve MDT's pavement design, weight enforcement, and general planning activities. WTI/MSU was tasked with evaluating the effectiveness of this new data collection program in meeting these objectives, as well as working with MDT to identify ways in which this tool could be better used in the future. Direct and quantifiable benefits realized during the initial evaluation period consisted of reduced pavement damage from overweight vehicles (valued at $700,000 per year) and the generation of more efficient pavement designs (valued at $4,100,000 per year). System costs were estimated at $604,000 per year, resulting in a cost-to-benefit ratio for STARS of 7.9.

Cost Allocation Studies for the Montana State Highway System (Principal Investigator). Studies were completed in 1992 and 2000 in which state highway revenues and expenditures for various users of the highway system were compared to see if they were equitably sharing the costs of providing them with highway service. These studies included characterizing the use of the state highway system by different commercial vehicle configurations, and subsequently identifying the revenue collected from them, and the specific costs they were responsible for in providing highway service to them. Following the equity ratio approach (ratio of revenue to expenditure), users of the state highway system were generally found to be paying their fair share of the costs of providing them with highway service in both studies, notably for state revenues and expenditures on the highway system.

Financing the Montana State Highway System (Principal Investigator). In this study, a pavement damage based fee structure was developed for the weight based portion of the vehicle fees paid by highway users in Montana.

Selected Publications

Stephens, J., and Carson, J. (2005), "Follow-on Evaluation of the Montana Department of Transportation's State Truck Activities Reporting System", Final Report prepared for the Montana Department of Transportation by Montana State University, Bozeman, MT.

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